see them. His reply was very emphatic: "Das ist ja ganz unmöglich!" I gathered from his further conversation that he belonged to the Intelligence Bureau of the Austrian Foreign Office, and that his work consisted in reading such journals. I envied him, but could not suppress my feelings of astonishment at his reading such "ganz geheimen Dokumente" in a public restaurant.

It may be mentioned in conclusion that Germany was much more liberal than Austria about the circulation of Entente publications. At least until the later months of the war, it was possible to go into any of the larger *cafés* of the German cities and enjoy a cup of coffee-substitute over a copy of the *Times, Le Temps, Secolo,* and various other newspapers of the Allied countries.

ROBERT W. LAWSON.

The University, Sheffield, December 17.

Royal Meteorological Society's Phenological Returns.

WITH 1920 the phenological returns complete the thirty years, which period is a recognised critical epoch in meteorological records.

In consequence of the war, our observing stations fell to 110 in 1918, against the high-water mark of 132 in 1914. We are most anxious now to recover lost ground, and would in this respect like to make 1920 preparatory to the years to follow.

A reasonable total would include at least 220 stations, an average of twenty only for the eleven Meteorological Office districts. At present we are short of this in all but South-east England and the Midlands. The six districts forming Scotland, Ireland, and North-east England average only 3½ each. Wales has two stations only, both in the south-west.

The observations asked for refer to the blooming of thirteen common flowers and the appearances of six birds and six insects. Other migrant records and notes are also invited, but these are of secondary importance.

A copy of the observing form and of a recent report will be sent with pleasure (the reports so far as they are available) to any readers of NATURE who would be interested to help.

We especially suggest the value for all interested in Nature-study and regional survey classes.

Inquiries should be addressed to one of us, or to the Assistant Secretary, Royal Meteorological Society, 70 Victoria Street, S.W.1.

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Einstein's Theory and a Map Analogue.

I AM grateful to the Director-General of the Ordnance Survey for directing my attention to an inaccuracy in my article in NATURE of December 11, p. 375. It was there stated that it is not possible to strain a map of the earth's surface so that all great circles become straight lines.

This is clearly contrary to the known fact of the central projection. As a matter of fact, the sphere is one of the limited class of surfaces for which it is possible to strain all geodesics into straight lines. For an arbitrary surface this is not true. The difference between the properties of the sphere and of the general surface gives a fair indication of the geometrical notions at the back of Einstein's theory.

E. CUNNINGHAM.

THE SUN DANCE OF THE TETON SIOUX.

AS man advances in the scale of culture he loses his dependence on Nature. The dweller in a modern city relies chiefly on artificial means for his pleasure and comfort, but the American Indian realised that his whole success depended on his co-operation with natural forces. He studied his surroundings and evolved a system of reasoning by which he attempted to explain them. A thoughtful Sioux Indian said to the writer: "When we see the changes of day and night, the sun, moon, and stars in the sky, and the changing seasons upon the earth, with their ripening fruits, anyone must realise that it is the work of someone more powerful than man. Greatest of all is the sun, without which we could not live. The birds and the beasts, the trees and the rocks, are the work of some great power." [1] Having recognised a creative power with the sun as its most important manifestation, it was a natural step in native logic to regard the sun with a reverence that is best expressed by the word "worship."

While the worship of the sun, in various forms, was widespread among the Indians of North America, the sun dance was a ceremony the observance of which was limited to certain plains tribes. The sun dance among the Santee Sioux differed in some respects from that of the Teton Sioux, which is herewith presented, but the underlying idea is the same. The sun dance was "the first and only religion of the Sioux," and even at the present time it is considered too sacred a subject for ordinary conversation. At the opening of the writer's study a member of the tribe said: "If we were to talk of the sun dance there should be at least twelve persons present, so that no disrespect would be shown, and no young people should be allowed to come from curiosity."

The purpose of the sun dance was the public offering to Wakaŋ'taŋka (Great Mystery) of what was strongest in the nature and training of the Indian—namely, his ability to endure physical pain. He did this in fulfilment of a vow made in time of great anxiety or danger, usually when on the warpath. The time of the sun dance was the full moon of midsummer, "when all Nature and even man is rejoicing." Into this joy and beauty, as though to give a greater contrast, the Indian projected his personal suffering. For a month before the sun dance it was customary for the medicine men to "pray for fair weather," singing their songs of magic power, burning sweet grass, and offering their pipes to the sky, the earth, and the cardinal points as they made their petitions. It is said that the oldest men cannot remember the falling of rain during a sun dance.

From long distances the people came and made their camp in a great circle. The dance enclosure was in the centre of this circle, and was about 50 ft. in diameter. Around it was erected a shelter for those who witnessed the ceremony. The sun-dance pole was placed in the centre of the dance enclosure, and near its entrance, which was toward the east, a large drum was placed, the singers being seated around this drum. About 15 ft. west of the pole a square of exposed and finely pulverised earth was located. This was called the "sacred place," and its preparation, as well as the securing and erection of the sun-dance pole, were accompanied by ceremonial songs and action.

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[1] "Teton Sioux Music." By Frances Densmore. Bulletin 61, Bureau of American Ethnology, Smithsonian Institution, Washington, D.C., p. 96. Other direct quotations, as well as the facts herein presented, are from the same work. The Bureau of American Ethnology has kindly given permission to reproduce the illustrations used in this article.

The tree for the sun-dance pole was sought as men seek an enemy. It could be cut only by a virgin selected carefully from the tribe, and the song while it was being felled was a song of war. The branches were cut off, and in a triumphal manner the pole was carried to the camp, where it was painted in vertical red stripes by the leader of the ceremony. The people watched the painting and erection of the pole with deep reverence, and listened while the leader sang the sacred songs that had come down to him through many generations —the songs of Dreamer-of-the-Sun. In one of these songs the pole speaks, saying: "Sacred (made holy) I stand"; and after the pole was in position the words of the song were: "Grandfather, at the places of the four winds may you be reverenced. You made me wear something sacred. The tribe sitting in reverence, they wish to live." The "sacred place" was then prepared, the earth being finely pulverised and two intersecting lines drawn in it, forming a cross. In these lines tobacco was placed, then covered with vermilion paint-powder, and over this was spread powdered gypsum, shining white in colour. At the intersection and ends of the lines were placed bunches of downy white eagle feathers. West of this was spread a bed of fresh sage, on which a buffalo skull would be laid during the ceremony, and between the two was a "pipe-rack" to support the stem of the ceremonial pipe. The people watched this also in silence, and the leader sang the following song: "Four times to the earth I prayed. A place I will prepare, O tribe, behold."

The sun-dance pipe (Fig. 1) was decorated in a prescribed manner by one of the most skilful women of the tribe. This pipe was carried by the leader of the dancers. Those who took part in the dance wore their hair loose after the custom of men who had recently killed an enemy. Each man wore a deer-skin apron that extended to his knees back and front. An eagle-bone whistle was hung around his neck, and on this whistle he blew as he danced.

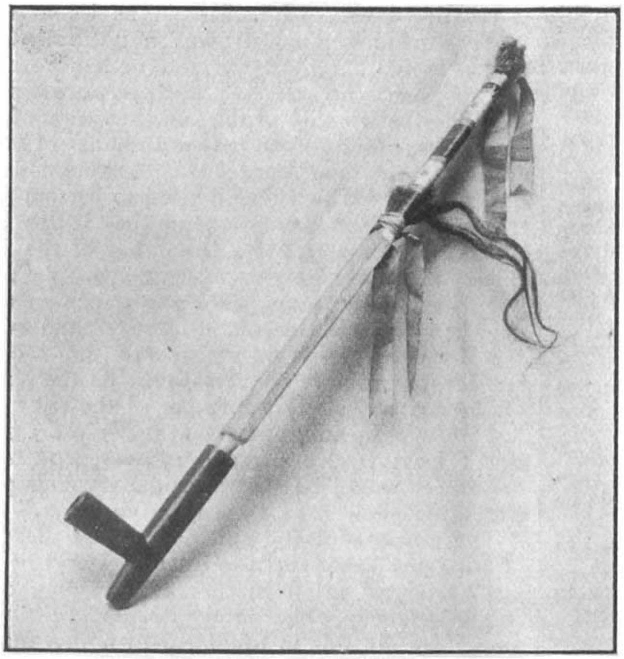

FIG. 1.—Sun-dance pipe.

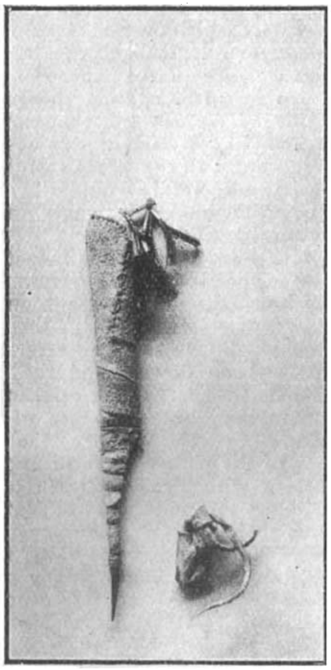

FIG. 2.—Knife used in inflicting sun-dance torture.

The torture of the sun dance was inflicted by the insertion of a short stick or skewer through the flesh of the chest or back, and placing a strain upon this until the flesh tore, releasing the man. While the word "flesh" is commonly used as suggesting the severity of the ordeal, the Indians said that "the stick was put through the skin." It probably penetrated also the subcutaneous fascia. A knife used in making the incisions is shown in Fig. 2, together with the shield covering the point of the knife when not in use. A man accustomed to the work lifted a small portion of the man's flesh (or "skin") between his thumb and finger, thrust the knife through it, following this with the pointed stick. The strain on the stick was secured by tying to it the ends of thongs that hung from the cross-bar of the sun-dance pole, the length of these being such that the man was only relieved from the strain by rising on his toes. He was, however, expected to dance until the flesh gave way. Others dragged buffalo skulls attached to their backs, and a man might request that the stick be tied to his horse. Another form of torture consisted in the cutting of gashes in arms and body. A man when making his vow designated the manner of its fulfilment, and those who witnessed the vow were expected to see that it was carried out.

After a man released himself it was customary to apply a powdered herb to the wound, which healed in a short time; it is said that even a swelling of the wound was unknown among the Sioux. The man then resumed dancing with eyes steadily fixed upon the sun, and continued dancing without food or water during that day and the following night. As the sun rose on the second day it was greeted by the leader with this song: "Here am I, behold me. I am the sun, behold me."

The scene of a sun dance, while the men are still dancing, is shown in Fig. 3, a drawing by a man who had taken part in the dance. The suspension from the pole and the carrying of buffalo skulls are seen, though the buffalo skulls were usually allowed to drag on the ground. The pole is decorated with streamers, and from the cross-bar are hung two effigies cut from raw hide, one representing a man (an enemy), and the other a buffalo. The drum is seen at the right with two singers beside it, and in the upper left-hand corner two women are carrying kettles of food. Feasts were often given in honour of young men taking part in the sun dance for the first time, and in the camp there were various events taking place during the dances.

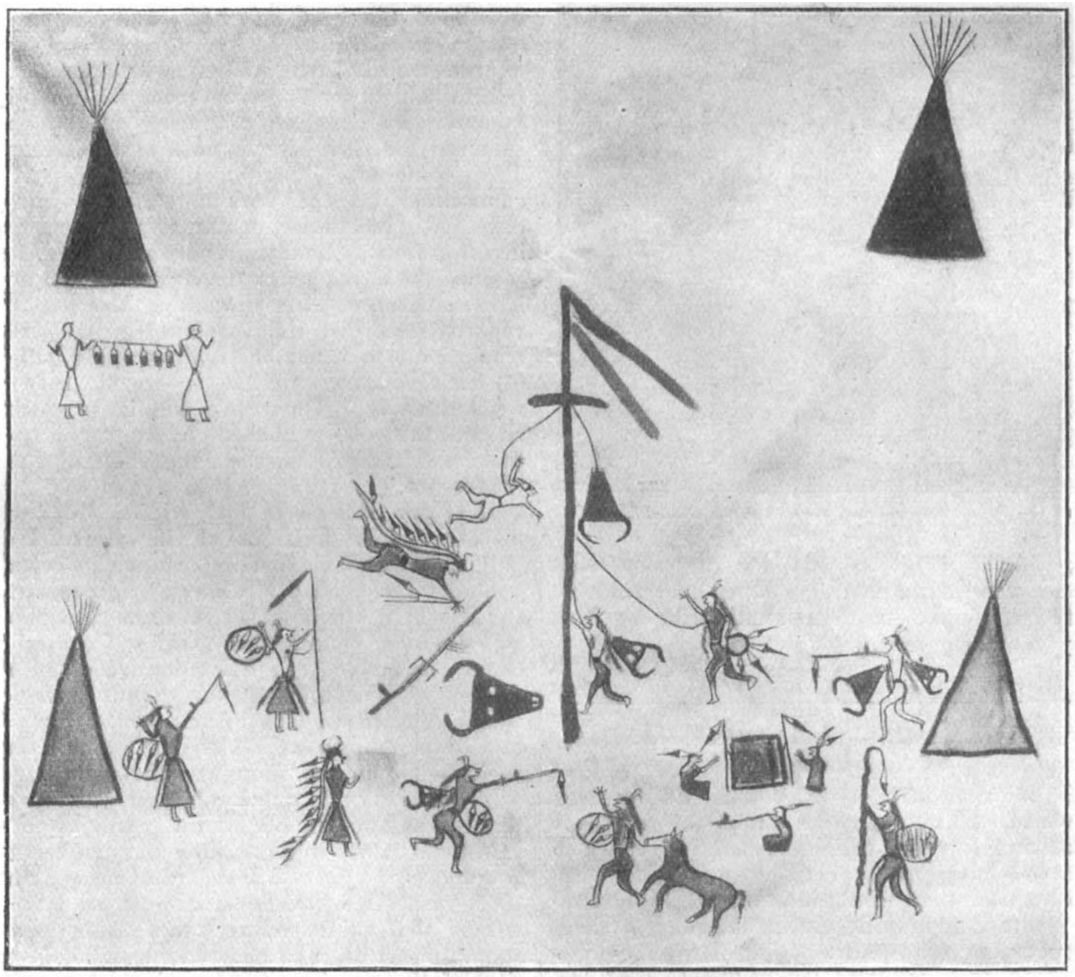

FIG. 3.—Native drawing of sun-dance.

During the second day the men fell from exhaustion, and after being carried into the shade they gradually regained consciousness. The evening of that day saw the sun-dance ground deserted, as it was the custom that all the people take their departure before sunset of that day.

While the element of pain forces itself on our thought, it is interesting to note the unselfishness underlying it. As the men were dancing they "prayed for all in the tribe, especially the sick and the old," believing that "an act performed publicly is more effective than the same thing done in private." The men who had taken part in the sun dance were men of fine character. White-buffalo-walking (Fig. 4) was one of those who fulfilled a vow in the last sun dance ever held by the Teton Sioux, that splendid tribe of the rapidly vanishing race.

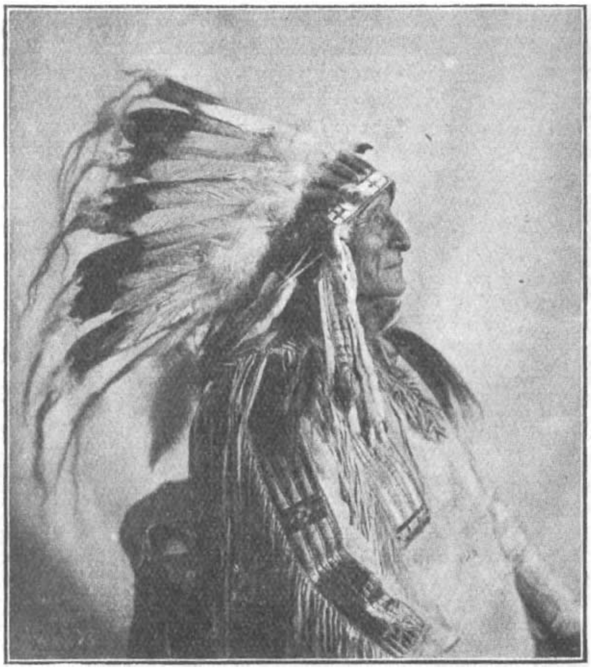

FIG. 4.—White-buffalo-walking, who took part in a sun-dance.

FRANCES DENSMORE.

THE INTERNATIONAL HYDROGRAPHIC CONFERENCE.

THE International Hydrographic Conference, which was held in London between June 24 and July 16, will, it is believed, mark a new era in hydrography. The revival of trade, with the consequent increased traffic on the high seas which will accompany it, makes the present time most opportune for the discussion of the methods of charting the seas and the publication of information to ensure safe navigation. Thanks to the initiative of the Admiralty, it was found possible to bring together most of the chief hydrographic experts of the world, and the decisions they have arrived at in the conference, and the general interchange of ideas which took place, will be fraught with good to the seamen of the world. Twenty-three countries were represented at the conference, amongst the representatives of which were the Hydrographers of Denmark, France, Great Britain, Greece, Holland, Norway, Sweden, and the United States of America.

The subjects to which the conference devoted its attention were "Charts," "Sailing Directions," "Light Lists," "Notices to Mariners," "Time Signals, Distance Tables, and Other Miscellaneous Hydrographic Publications," "Tide Tables," "Instruments Used for Surveying on Shore and at Sea," "Time-measuring Instruments," "The Interchange of Publications," and "The Establishment of an International Hydrographic Bureau."

The subjects, it will be seen, practically covered the whole field of hydrography, and the main object of the conference was to compare the practices of all countries, with a view to the adoption by all of the best methods, and so more or less to standardise the hydrographic publications of the world. All seamen will appreciate the benefit which must accrue from the adoption of common methods of producing all information required for their use to ensure safe navigation. The conference therefore divided itself into committees on the various subjects, and from day to day these committees pursued their investigations, finally reporting to the conference the agreements at which they had arrived. The conference, after discussing the committees' reports, recorded its decisions in a series of resolutions, to which the hydrographic authorities of each country will, it is hoped, give effect without delay. The result will be practically to standardise all published hydrographic works, and will amply justify the holding of the conference.

It is not possible in this brief account to enumerate all the decisions of the conference, and only a few of the most important can be noted.

Under the head of "Charts," agreement as to the use of a common set of signs and abbreviations which denote the various features on a chart was arrived at. The adoption of the metric system of measurement for depths and heights was discussed at length, but whilst the conference unanimously expressed the opinion that all nations should, as soon as convenient, adopt it in their charts and publications, it was recognised that it was not possible for the countries not using it in their charts to do so until the metre had been adopted as the general standard of measurement in their respective countries, and it was therefore agreed that those countries not using the metre should insert on their charts tables for the conversion of the measurements used to the equivalent measurements of the metric system, and that in their sailing directions, light lists, etc., the metric measurements should follow the national measurements. The transcription of names received attention, and it was agreed that generally the literal, and not the phonetic, transcription was desirable.

Under the head of "Sailing Directions," the general arrangement of these important addenda to the charts was discussed, and the necessity for the publication of an annual supplement to each volume to bring it up to date was recognised. An improved method of describing tidal streams and currents was adopted. Bearings, it